Silviculture Practices Section
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SILVICULTURE NOTE 26

SHEEP GRAZING IN FORESTRY[1]

Introduction

Sheep grazing as a vegetation management tool in BC, was first used on a trial basis in 1984 in the Cariboo Forest Region. Since becoming operational in 1990, the option has been used for site preparation or brushing in all six forest regions. Altogether, about 200 operational contracts have been completed in 20 forest districts. Currently, 5000 to 6000 ha of forest land are successfully grazed each year.

Our experience has shown that within a planned vegetation management regime, prescription grazing, either by itself or in combination with other treatments, can provide a viable option for managing competing vegetation on a range of forest regeneration sites. The method is most suitable on sites where moist-rich soils promote dense herbaceous vegetation that seriously reduces survival and growth of young conifer trees or where long-term growth is slowed by early succession of deciduous species.

Based on a single-entry (one season) treatment, the cost of sheep grazing is normally cheaper than manual brushing and more expensive than aerial herbicide treatments. The current (1997) regional average costs for a one-season sheep grazing treatment ranged from $250 to $470/ha. The provincial average in the same year was $360/ha. Openings close to established sheep ranches have cost as little as $150/ha while some small isolated treatment areas have cost as much as $800/ha. In general, two to three grazing seasons may be required to treat areas with dense, established vegetation. On backlog sites, where seedlings are in poor condition, this may take even longer.

The purpose of this note is to provide information that may be used to determine if sheep grazing is a viable option for a treatment area. The note identifies site conditions that are appropriate for grazing.

Figure 1. Vegetation management using sheep in the Prince George Forest Region.

[1] This Silviculture Note is based on current research and operational experience. It will be revised as new information becomes available.

BRITISH COLUMBIA
Ministry of Forests

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Sheep Management

Sheep-health Protocol and Other Legislated Requirements

The *Forest Practices Code Silviculture Practices Regulations* (Part 2, Division 2:3, 4) provides direction on the use of livestock for vegetation management or site preparation. To meet the requirements of the Regulations, the *Guidelines for the Use of Domestic Sheep for Vegetation Management in BC* (Revised), April 1999 which includes *Health Protocol for Sheep Used in Vegetation Management in BC*, must be followed. The BC Ministry of Forests, BC Ministry of Agriculture, Food and Fisheries, and BC Ministry of Environment, Lands and Parks produced the document. The guidelines outline inter-agency responsibilities and contract requirements to meet these standards. They include health conditions, minimum sheep size, medications, pre-contract flock inspections by veterinarians, and operational and administrative procedures.

Site Selection

Wildlife and Riparian Habitat

There are a number of locations and circumstances that may not be compatible with sheep grazing. They include:

Watersheds – grazing is restricted within riparian zones and water should be trucked, pumped or gravity fed to troughs located outside the riparian zone. Night corrals are not allowed to be constructed in riparian management areas or sites that drain directly into a watercourse. Community watersheds are often off-limits to livestock grazing.

Critical wildlife habitat – areas which are within, or in close proximity to, sensitive habitats or threatened wildlife populations.

Concentrated grizzly habitat – areas where the potential for domestic sheep to become easy prey to grizzly bear is unacceptably high. This circumstance may predominate when grizzly density is high and/or when topography or cover is favourable to predators.

Wild sheep or goat habitat – areas known to be heavily populated by wild sheep or goats. It is important to ensure that there is no physical contact between domestic sheep and wild goats or sheep, notably Bighorn sheep *(Ovis canadensis* spp.). It may be necessary to stay out of all or a portion of a drainage or to modify the timing of a graze.

Slash

Many sites have slash left on site after harvesting. Slash cover of less than 10% by area and slash height less than 30 cm are optimal for sheep grazing. Sheep cannot navigate through slash greater than 50 cm deep, but will work around it. It is important that the site is prepared to eliminate access problems and potential hazards to sheep.

Topography

To ensure sheep are managed appropriately and predation minimized, the shepherd should be able to see the flock clearly at all times. Uneven terrain and frequent clumps of large brush species, such as alder, impede the visibility of the flock. The shepherds should be able to see the sheep and dogs at work from the ever-changing vantage points. Although sheep are well adapted to grazing on steep slopes from 60% to 70%, slopes between 10% and 35% are preferred. In steep slope situations, strict obstacle planting is required as hooves can shift conifer plugs in freshly planted and/or coarser soils, especially in wet weather. Sheep will require more herding and have greater chance of injury as slope gradient increases. Danger from falling debris, such as boulders and sliding tree trunks, must be assessed. Where slope gradient and/or unstable soils preclude the use of machinery or fire, sheep can be a viable option. Avoid very wet sites that restrict sheep movement, as sheep will not graze areas of standing water.

Bedding Sites

Sheep need to be bedded down overnight where shepherds, guardian and herd dogs are present. Bedding areas should be located in the open, as forested edges provide cover for predators. Preferred bedding areas may include:

- landings and camp areas if they are not ripped and planted
- unused road and their associated turn around spots. Such sites usually have good drainage and can be used for both corrals and camp. Access is easy and useable ditch water may be available.

A sheep requires up to one gallon of water per day. While a portion of this requirement can come from the dew or moisture content of the vegetation that is eaten, water must also be provided. Water may be trucked to the bedding area, pumped or gravity fed from streams, and sometimes can be taken from nearby ditch or run off sources. Sheep also require salt, which is normally supplied at the bedding grounds.

Trailing sheep back and forth to the treatment site each day should be limited to a maximum of 1 or 2 km since it is time consuming and cuts into the available hours for actual grazing. Trailing can be avoided by establishing a tent camp on or near the block if trailers cannot be brought in.

After grazing, the bedding site should be cleaned up. The bedding area can be ripped to incorporate manure accumulations.

Logistics and Planning

The best economics for both the contractor and the client is a full season of work. In practice, this translates to approximately 300 ha per 1000 head of sheep. A contract should be for at least 90 days if locally possible and if weather permits.

Flock Size

An ideal flock size consists of 1500 ewes with lambs. This flock size can graze 2 to 6 ha/day in spring but less in mid-summer, since competing vegetation biomass in mid-summer (3000–4000 kg/ha) is larger than that in spring (500–1500 kg/ha). Also, since herbaceous vegetation has greater consumable biomass than shrubs, it takes longer to graze herb-dominated sites.

Block Size

Sheep can graze openings of any size. A large flock can be used to graze a small block if a larger opening is nearby. However, a moderately sized opening with no other treatment area within trucking distance is not cost effective to graze. The opening size may not be as important a factor as the logistical sequence of openings to be grazed. Many times, field personnel have only one site suitable for grazing. Often two or more smaller grazing units within different operating areas can be logistically amalgamated. The individual small openings can be grazed with a smaller flock size (e.g., 600 sheep). In this situation, sheep can be moved between grazing sites with lighter transportation equipment (e.g., $^3/_4$–1 ton truck with gooseneck sheep trailer — 33 ft. assembly). Sheep can also trail distances ranging from 10 km uphill to 30 km on flatter terrain daily if food, water and rest areas are provided.

Sequence of Treatment

Sites must be closely monitored to achieve balance between an early start to grazing and sufficient quantities of vegetation. As the season progresses, management goals, weather and vegetation density, type and preference can change. Yearly plan development must be flexible, and incorporate elevational and opening sequence, timing of flush and effective vegetation removal and predator avoidance. Often openings are stratified and only the sites with the densest vegetation are treated. Large openings are best divided into treatment units and daily units.

Where a series of plantations is distributed over an elevation gradient, sheep can be herded from low- to high-elevation sites to maintain high forage quality of palatable plants. The same plantations are grazed again on the way down, but the high-elevation sites are treated only once because of the short growing season. Less forage may be available on the second pass over the opening. Alternative blocks or forage sources must be available nearby so that sheep can be moved if forage becomes depleted. Generally, effective grazing occurs from the time that sufficient vegetation is present on the site until the first frost.

Preferred Vegetation

Livestock have a species preference that is predictable. Sheep will usually browse selectively, starting with the most favoured vegetation and progressing to the next most desirable species. The favoured vegetation may not be a single species but may include many different plants. Preferences for target competing vegetation will change as the season progresses and plants mature.

Sheep prefer succulent new vegetation early in the growth cycle and the regrowth on vegetation previously grazed. Vegetation at these stages appears to be both palatable and nutritious. As the season progresses, most herbaceous and grass vegetation become less preferred as plants form seeds. Protein content in the foliage decreases by the end of August (except at high elevation, north aspects), dropping below the level required for sheep maintenance. If grazing is to be continued into late August, previously grazed blocks with resprouting vegetation are preferable. Both frost and drought can alter forage palatability and make it unacceptable for sheep.

Vegetation species that are highly preferred by sheep, such as aspen, cottonwood, dogwood, willow, reedgrass (new growth), fireweed, and herbs (cow parsnip, lupine, valerian and most high elevation species) can be treated easily and effectively. Species of low palatability including maple, birch, black twinberry, elderberry, blueberry spp., salmonberry and thimbleberry can be treated when in low frequency or moderate frequency when first establishing (early in the season). The site may have to be grazed again in the same season.

When the frequency of species of medium to high preference falls below 50–75%, an assessment by experienced personnel is recommended. For additional

information on species preference and other site factors that determine the applicability of sheep treatment, see the field card *Sheep Grazing Site Selection Guidelines* (FS 235).

The target species is most significantly affected when only new sprouts are available and the whole plant is completely consumed. Sheep graze mainly on herbaceous target vegetation, fireweed in particular. Herbaceous or low-growing shrub vegetation is best grazed as it is establishing from seed, roots or rhizomes, approximately 1.5 years after ground disturbance. *Calamagrostis* in early growth, and grasses in general are preferred forage for sheep. Good control of *Calamagrostis* spp. is attributed to early timing (i.e., one week following planting and early in the year when palatability is high). Deciduous shrub and mixed communities are best grazed when establishing from seed or suckers 1.5–3 years following ground disturbance. Successful control of young aspen trees has been achieved before they exceed 1.0–1.5 m in height. Deciduous brush becomes unreachable for effective browsing within 2–4 years. Aspen can be controlled in 2–3 years with a combination of three or four grazing treatments. Browsing to remove leaves twice per season is more effective and damaging than one treatment per year over two years. Because leaves or above-ground plant parts are clipped, photosynthetic function is reduced and hence carbohydrate reserves are depleted as they are forced to resprout leaves twice in one year. Continued grazing the following year(s) will cause stem mortality from lack of stored energy for respiration over winter.

Grazing Frequency

At the early stages of competing vegetation development (e.g., fireweed), one season's grazing may be all that is needed to achieve a free growing stand. Shrub species under 1.5 m and dense vegetation complexes close to palatability thresholds are target sites for twice-yearly grazing. Repeated grazing can impair the physiological processes of target plant species. Some managers set aside the densest and most unpalatable herbaceous and/or brush openings for regrazing. The first graze should be the earliest of the season so less volume of unpalatable species is consumed. The second graze will reduce stem density and vigour drastically in following year(s), so much so that a third grazing, if the plants have recovered, will occur much later the following season. Three grazing passes in this manner have caused extensive stem mortality on most species (except established reedgrass). In general, two grazing passes in one year are enough. The time between the first and second passes on a plantation is site specific and can range from 40–70 days before an adequate supply of forage is again available for sheep grazing (i.e., spring graze followed by mid- to late-summer regraze).

Removing the vegetation early in the establishment stages can prevent a more serious vegetation competition problem. When vegetation control is delayed, seedling growth may be compromised and additional grazing treatments may be required before the seedlings are released.

Potential Damage to Seedlings

Seedlings are most vulnerable to mechanical damage and sheep browsing during the period from bud flush to stem elongation. Sheep hooves brushing against very young seedlings can knock off freshly emerging terminal shoots. The browsing of conifer terminals is largely determined by the sheeps' preference for that plant part relative to the range of species growing alongside. Spruce, western redcedar and balsam fir are very unpalatable to sheep, hence the sites occupied by these species can be grazed during bud elongation. In contrast, Douglas-fir requires 75% cover of palatable competing vegetation to draw attention away from its flushing buds. Pine species may have 10–50% of their terminal shoots damaged by nipping. To reduce damage to flushing seedlings during grazing, sheep should be spread out (approximately 1 m between sheep). When seedlings have hardened-off, their palatability declines rapidly and they are less susceptible to damage. Dormant Douglas-fir and pine (possibly larch) should still be closely monitored.

Sheep Grazing Combined with Other Treatments

Often, the effectiveness of grazing can be enhanced if it is combined with one or more other treatments such as manual brushing, herbicides or mechanical site preparation. Examples of situations where sheep can be used in combination with other treatment options are provided below.

Manual treatments – Sheep grazing may be combined with manual treatments where manual treatments are used on portions of the block that are inaccessible to sheep (e.g., heavy slash, tall vegetation).

Herbicide treatments – Grazing may be prescribed early in the season as a site preparation treatment. The grazing of the vegetation complex will result in a second flush of vegetation, which may be susceptible to herbicides later in the season than would normally be the case. Herbicide can be applied after the newly planted seedlings are dormant.

Mechanical treatments – Under this option, the operator removes unpalatable patches around seedlings, carefully removing as much of the suckering root mass as possible. The patches are then seeded with a grass-legume mix. Sheep will then be used to graze the palatable grass and legume cover.

Grass-legume mixtures – After a prescribed burn or mechanical site preparation, spring seeding of appropriate cover crops (e.g., grasses and/or legumes) can replace very aggressive unpalatable vegetation. The sheep can then graze this more preferred vegetation. The number of grazing seasons is reduced as a lower form of vegetation is less light restricting and helps prevent brush establishing by seed. Clover can supply as much as 70 kg/ha of usable nitrogen per year.

Planting techniques – Obstacle planting, planting on high sites and south aspects, as well as row or cluster planting can be carried out on sites planned for grazing. Some kinds of site preparation (e.g., mounding) are not compatible with a grazing treatment.

Additional Information

The following information is available through the Ministry of Forests web site at: http://www.for.gov.bc.ca/hfp/forsite/sheep/index.htm:

- *Sheep grazing site selection guidelines*. Ministry of Forests FS 235 (04/00).
- Sheep-vegetation management mentors list.
- *Guidelines for the use of domestic sheep for vegetation management in BC* (revised). (Also at http://www.env.gov.bc.ca/rsb/sheepveg/sheep.html.)

Another useful reference is Land Management Handbook 34, *Sheep grazing guidelines on forest plantations in British Columbia*, 1995.

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